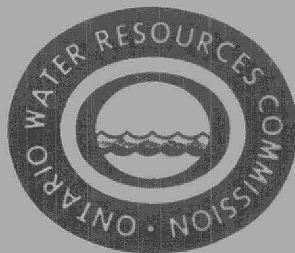


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THE
ONTARIO WATER RESOURCES
COMMISSION

WATER POLLUTION SURVEY

of the

TOWN OF RICHMOND HILL

REGIONAL MUNICIPALITY OF YORK



1971

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REPORT ON A
WATER POLLUTION SURVEY

OF THE
TOWN OF RICHMOND HILL
REGIONAL MUNICIPALITY OF YORK

DIVISION OF SANITARY ENGINEERING
DISTRICT ENGINEERS BRANCH

December, 1971

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INTRODUCTION

Field work for a water pollution survey of the Town of Richmond Hill was done during May, June and August, 1971. The purpose of the survey was to compile and assess the water quality of outfalls and watercourses in the Richmond Hill area.

In 1964, an initial survey was undertaken in the Town of Richmond Hill. During the latest survey many of the locations covered in the initial survey were resampled plus a number of outfalls which have originated since then.

Bacteriological and chemical samples were collected from all sample points in the town. The samples obtained were grab samples and reflect the conditions at the time of sampling only.

The sample results of the initial survey have also been included in this survey.

I SUMMARY AND RECOMMENDATIONS

This is a report on a water pollution survey of the Town of Richmond Hill.

Domestic water for the town is provided by five municipal drilled wells. The water level records indicate that the water taking exceeds the recharge and thus the aquifer is being mined. Therefore, additional supply will most likely be required in the future.

Sanitary wastes are directed to a conventional activated sludge plant with the effluent discharging to German Mills Creek, a tributary of the east branch of the Don River. A new 1.4 MGD sewage treatment plant is planned for the south-west corner of the town and will discharge direct to the Don River.

The Division of Industrial Wastes of the OWRC maintains routine inspections on some of the industries in the town.

Subdivision development in the Richmond Hill area should be controlled to prevent overloading of the sewage plant(s) and the deterioration of the quality of the Don River at the head waters.

The majority of the high BOD values and coliform counts are from storm sewer outfalls located in the north-east and central sections of the town.

The town and some industries should clear the debris and refuse from the watercourses which flow through or adjacent to their property to maintain free flow and the aesthetic quality.

Recommendations

1. The Town should monitor their wells on a daily basis, that is, water level measurements (pump on and off, plus consumption records).
2. The town engineer should prepare a program to correct sewerage infiltration problems.
3. The Town should update its sanitary and storm sewer plans.
4. Industrial discharges should be controlled by a good sewer - use by-law and enforcement programme.
5. Industries and the town should keep the watercourses which flow through or adjacent to their property clear of refuse and debris.
6. Outfalls and sample points marked (#) in the appended tables should be investigated by the town to find and alleviate the cause of the adverse sample results.
7. Development in the town should not outstrip the capacities of the water and sewerage services.

II GENERAL

The Town of Richmond Hill is located approximately 14 miles north of Metropolitan Toronto on Highway 11. When the Regional Municipality of York was established on January 1, 1971, the boundaries of Richmond Hill were expanded. The new boundaries are as follows:

North Boundary - CFRB Side Road

South Boundary - Highway No. 7

East Boundary - Proposed Highway No. 404

West Boundary - Bathurst Street

The population of the town prior to January 1, 1971 was 19,577 persons, but after implementation of the new boundaries the population was 33,258 persons.

III DRAINAGE

The Town of Richmond Hill is drained by roadside ditches and storm sewers which discharge to watercourses flowing through the town.

The eastern portion of the town is drained by two creeks which are tributaries of the Rouge River. The centre and western portion of the town are drained by three creeks which flow to the east branch of the Don River.

IV MUNICIPAL WATER SUPPLY

The water supply for the old town is provided by five drilled wells. Four of these wells are used regularly and the fifth is used only during periods of high demand. The fifth well (No. 1) is not treated but the treatment at the other four wells consists of chlorination and iron removal. The pumps at the four wells are controlled automatically by the level of the water in the ground reservoir.

The storage for the system at present totals 1,000,000 gallons comprised of the following components:

Elevated tank	500,000 gal.
Underground reservoir	500,000 gal.

The total amount of chlorine gas used during 1969 and 1970 was 4,326 and 4,483 pounds, respectively, and in 1971, the amount used for 11 months was 4,288 pounds.

(a) Capacity & Pumpages

The total pumping capacity of the five wells is 2.95 MGD. Wells 2 - 5, which are treated, have a total pumping capacity of 2.74 MGD, however the volume of treated water is limited by the 2.23 MGD iron filters.

Approximately 3,300 IGPM of high lift pumping capacity is available at the treatment works.

The statistics of the pumpages for 1969, 1970 and for 11 months of 1971, are as follows:

	<u>1969</u>	<u>1970</u>	<u>1971</u> (11 months)
Total Pumpage	470,650,200 gals.	490,100,500 gals.	440,050,000 gals.
Maximum Daily Pumpage	1,927,300 gals.	1,827,500 gals.	1,840,000 gals.
Minimum Daily Pumpage	971,300 gals.	924,800 gals.	890,000 gals.
Average Daily Pumpage	1,289,452 gals.	1,342,741 gals.	1,320,000 gals.
Gallons per capita per day	66 gals.	69 gals.	67 gals.

The water level records indicate that the pumping level of the water in well No. 5 has been below the top of the screen since June of 1968. The aquifer is being depleted and well No. 5 cannot be maintained at its design capacity. It should be noted that the other municipal wells tapping the aquifer are probably under the same condition.

(b) Water Quality

The raw water from all the wells is hard and has a high iron content, but after iron removal the iron content is within the OWRC objectives (0.3 ppm). During 1969, 2.5 per cent of the bacteriological samples contained coliform bacteria. In 1970, 156 samples were collected and five or 3.2 per cent of

these were adverse. To date 149 samples have been collected and only 2 or 1.34 per cent of these indicated the presence of coliforms. These sample results confirm that the water is of safe bacterial quality.

V SEWAGE TREATMENT

(a) Design Data

Design Flow - 1.6 MGD	Population Equivalent 16,000 @ 100 GPCD	
	<u>BOD</u>	<u>SS</u>
Raw Sewage	200 ppm	220 ppm
Removal	90 %	95 %

The Richmond Hill water pollution control plant operates on the conventional activated sludge principle. The treatment facilities consist of grit removal, primary sedimentation followed by aeration, secondary sedimentation and chlorination. The digestion system consists of a two-stage anaerobic digester. A new addition this year is a flow-equalization tank ahead of the plant.

(b) Operation

The estimated population served by sewers in the old town of Richmond Hill is approximately 19,500 persons. Based on this population the average daily per capita sewage flow during 1970 was approximately 115 gallons, when the average daily flow was 2.25 MGD. It should be noted that this average daily flow was 141 per cent of plant design. It should be noted too, that based on the water pumpage data presented previously, approximately one half of the sewage received at the sewage treatment plant is storm water.

Based on a nine month period the average daily flow in 1971 increased to 2.4 MGD. This increased flow was 150 per cent of plant design. The BOD and suspended solids loadings also increased to 153 and 206 per cent respectively of plant design.

The plant has no reserve capacity and additional loading could cause septic conditions. To help relieve adverse loading on the sewage treatment plant, roof downspouts should not be allowed to be connected to the sanitary sewer system. Future sewers should be constructed in a manner to limit infiltration, and checks should be made for infiltration in existing sewers. A good sewer use by-law should help control waste flows at commercial and industrial sources. If sluggish sewers exist these should be flushed periodically to avoid having the settled septic material arrive at the plant in a slug after a rainfall. A sewer cleaning programme should be carried out regularly.

In 1970 when flows exceeded 3.0 MGD, raw sewage was bypassed nearly 9 per cent of the time. During the spring and usually after a heavy rainstorm, bypassing occurred; this can be partly attributed to problems

of infiltration. It should be noted that during periods of flood flows the chlorine feed rate was increased to 200 pounds per day in an attempt to obtain disinfection of the treated effluent.

Construction of a new flow - equalization tank was completed this summer. This 350,000 gallon tank will receive the flows which ordinarily would be bypassed and then return the sewage to the primary settling tanks during low flow periods. Plant personnel are trying now to operate the plant between 2.2 to 2.5 MGD with any flows above 2.5 MGD being directed to the storm tank. When excess flows occur and the flow - equalization tank is full, the sewage is bypassed to the receiving stream after the removal of settleable solids.

(c) Assimilation Study

According to an OWRC Wastewater Assimilation Analysis (1966) of German Mills Creek, it was suggested that the strength of the plant discharge should be limited to 10 ppm (160 lbs. BOD per day). This discharge at the above concentration would still allow acceptable quality conditions throughout most of the creek and not interfere unduly with existing and proposed water uses.

Presently the BOD loading to the receiving stream is about three times the recommended loading limit mentioned above.

(d) North Don Plant

A new 1.4 MGD plant which will serve a proposed subdivision is to be built in the south-west section of the town. Some of the flow from the old sewage treatment plant is slated to be directed to this one.

VI DISCUSSION

The Richmond Hill sewerage system is subject to infiltration especially in the north-east section of town. This infiltration has caused basement flooding during periods of heavy rainfall or runoff. The Commission has received complaints from residents of the town as well as being notified by the York Regional Area Health Unit of the basement flooding. The town is trying to alleviate this problem by using portable pumps at manholes of the sanitary sewers and pumping the raw sewage into covered storm drains and/or roadside ditches. This is not an acceptable method to remedy the flooding problem and the town has been notified accordingly by the Commission and the health unit.

This problem of basement flooding has been occurring for a number of years and the town and council are aware of this condition. Reportedly, there are and have been steps taken by the town to prevent basement flooding. In the past the town has had larger and more efficient sanitary and storm sewers constructed in the Crosby Avenue and Neal Drive area. It is also planned to have improvements made to the sanitary system in the Browndale Crescent area in 1972. The town has engaged a consulting engineering firm to prepare a detailed study of the 10-year needs of

the municipality. The report will include a study of the sanitary sewers, storm sewers and water distribution system as well as an evaluation of the town's treatment facilities.

The new North Don Sewage Treatment Plant when constructed might be considered as interim measure. Approximately half a million gallons per day (MGD) is slated to be directed to it from the hydraulically overloaded Richmond Hill sewage treatment plant. This transfer of flows aided by the new storm tank will improve the treatment efficiency at the Richmond Hill plant and reduce the stream loading. It should be stressed that this does not mean that the plant has additional capacity since this plant will still be receiving loading above its design capacity.

The proposed population increase from a subdivision which is to be serviced by the North Don sewage treatment plant would be approximately 12,000. The sewage flow from this development plus the .5 MGD flow which is slated to be directed to the proposed new plant will probably approach this plant's capacity.

The Commission has engaged the firm of Gore and Storrie Limited, to update and revise its previous report on water supply and pollution control for the York Central area. The consultant has been requested

to explore interim measures that might be required to provide sewage service in the area until such time as long-term facilities can be made available. Completion of the study by the consultant is anticipated early in 1972.

VI INDUSTRIAL WASTES

(a) Ratcliffe Canada Limited

This plant manufactures copper and brass strips and operates on a 5-day, 3 shift basis.

The amount of water used in the plant for cooling and domestic purposes is in the order of 730,000 gallons per week (5 days). All processing wastes including cooling water and domestic wastes are discharged to the sanitary sewer.

Pretreatment Facilities

Rinse water from the pickling operation is re-circulated and, then periodically pumped to a sump. The sump contents are neutralized and the metal waste precipitated out. The waste volume pretreated is approximately 10,000 gallons/day.

To ensure that waste going to the sanitary sewer does not contain high or unacceptable concentrations of metals, the company is monitoring the effluent from the treatment facilities and the total plant effluent on a daily basis. The analytical results are being reported to the Town of Richmond Hill weekly.

Metallic sludge from the treatment works is discharged to a sump and dried. The dry sludge is hauled away for disposal.

(b) Reynolds Extrusion Co. Ltd.

This company manufactures aluminum garden furniture, industrial ladders, custom extrusions and drawn-aluminum tubing.

The caustic wastes from the dye cleaning operations are being discharged to a 5,000 gal. storage tank prior to trucking.

Earlier this year it was found that oil from an extrusion press was discharging to the plant storm sewer via a quench tank drain. This problem was corrected and now all wastes from the sump pits around the extrusion presses are directed to the sanitary sewer. Permanent oil separators are going to be used on each extrusion press quench tank to prevent oil from reaching the sanitary sewer.

VIII DEVELOPMENT

No favourable comment will be forthcoming on development discharging to the Richmond Hill Sewage Treatment Plant due to its overloaded condition.

IX SAMPLE RESULTS

The laboratory results of the bacteriological examinations and the chemical analysis of samples collected from the watercourses and outfalls are included in the tables appended to this report.

The majority of the high BOD values and coliform counts are from storm sewer outfalls located in the north-east and central sections of the town. Some of the storm sewer outfalls which have adverse results are as follows:

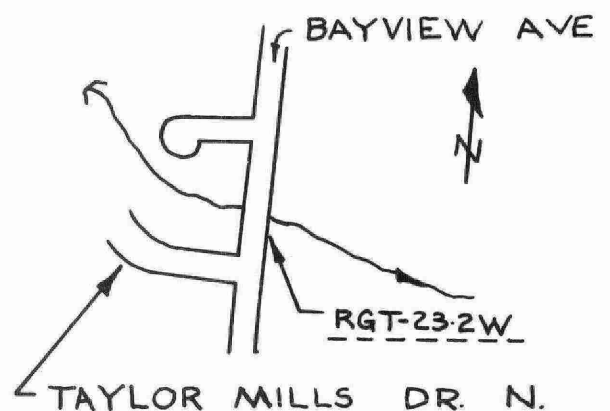
RGT-23.2W

- Avg. BOD - 300 ppm

Avg. P - 20 ppm

Avg. Total coliform - 42.3×10^6 per 100 ml

Avg. Fecal coliform - 670 per 100 ml



The drainage from this storm sewer outfall on August 19, 1971 was dark black in colour. There was also a thin layer of a semi-solid film on the surface of this undesirable waste.

DEG-23.6W-1

- BOD - 280 ppm

P - 9.7 ppm

ABS - 30 ppm

Total coliforms - 44×10^6 per 100 ml

Fecal coliforms - 1520 per 100 ml

This outfall drains Markham Road between Yonge Street and German Mills Creek. The sample results quoted above are indicative of wastes which contain sanitary sewage.

DEG-23.6W-2

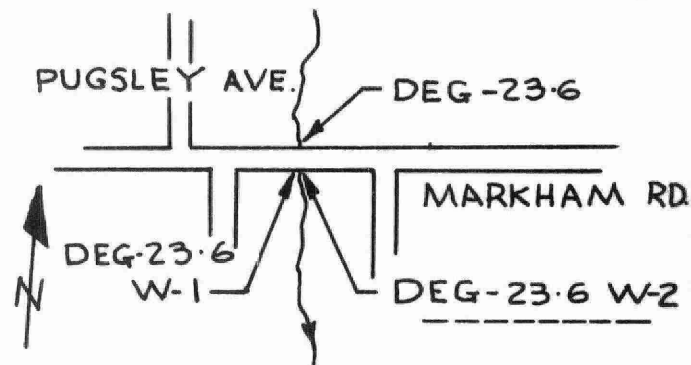
- Avg. BOD - 41 ppm

Avg. P - 2.21 ppm

Avg. ABS - 23.4 ppm

Avg. Total coliforms - 133,500 per 100 ml

Avg. Fecal coliforms - 1,390 per 100 ml



Any storm flow from Markham Road between Bayview Avenue and German Mills Creek and a small section of Bayview Avenue north of Markham Road is picked up by this storm sewer. On May 10, 1971, soap suds were evident at the base of this storm sewer outfall.

in the rest of the town.

For a number of years water samples have been taken of German Mills Creek upstream and downstream of the sewage treatment plant by the plant personnel. The sample results which appear in Table VII represent samples collected from January to September this year. The sample results taken at the Roseview Avenue sampling locations were usually high, e.g. average coliforms per 100 ml of 41,400 and the possible cause for these results is the discharge from outfall DEGT₁-23.9W which is located behind the town's works yard. The sample results of samples taken at the Markham Road location south of the two outfalls DEG-23.6W-1 and W-2 were also high, e.g. average BOD of 7 and average coliforms per 100 ml of 308,000. Reportedly toilet paper and odours have been noticed at this location. It should be noted that the effluent outfall from the sewage treatment plant is downstream of this sampling location. The sample results of each sampling location downstream of the sewage treatment plant tend to fluctuate from high to low and vice versa.

The foregoing is another good reason for the town to investigate the outfalls mentioned and determine the cause and reason for the high BOD and bacteriological sample results.

outfalls at this sample point drain Bayview Avenue plus some of the Neal Drive and Taylor Mills Drive areas. Apparently roadside ditches around Browndale Crescent also drain into this storm sewer system via a catch basin. Reportedly, the flow from portable pumps at manholes of the sanitary sewer is directed to these roadside ditches to help prevent basement flooding during periods of heavy rainfall.

Water samples that were taken at DEG-23.8 on August 19, indicated the presence of sanitary sewage. Located at this point is a sewer relief overflow which appears to have been used recently or was leaking because the water at the base of the concrete spillway was black with a noticeable odour.

The sample results at sampling point DEGT₂-24.05 have been getting worse this year. The BOD has increased from 2 ppm to 24 ppm with the total coliform also increasing from 640 to 2.6×10^6 per 100 ml. These increases in values could possibly be attributed to seepage from the garbage and other refuse behind Horticultural Products.

The BOD and bacteriological results of water samples taken from the watercourses in the western portion of town tend to be lower when compared to samples taken

DEGT₁-23.9W

- Avg. BOD - 8 ppm

Avg. Total coliforms - 307,000
per 100 ml

Avg. Fecal coliforms - 14,000
per 100 ml

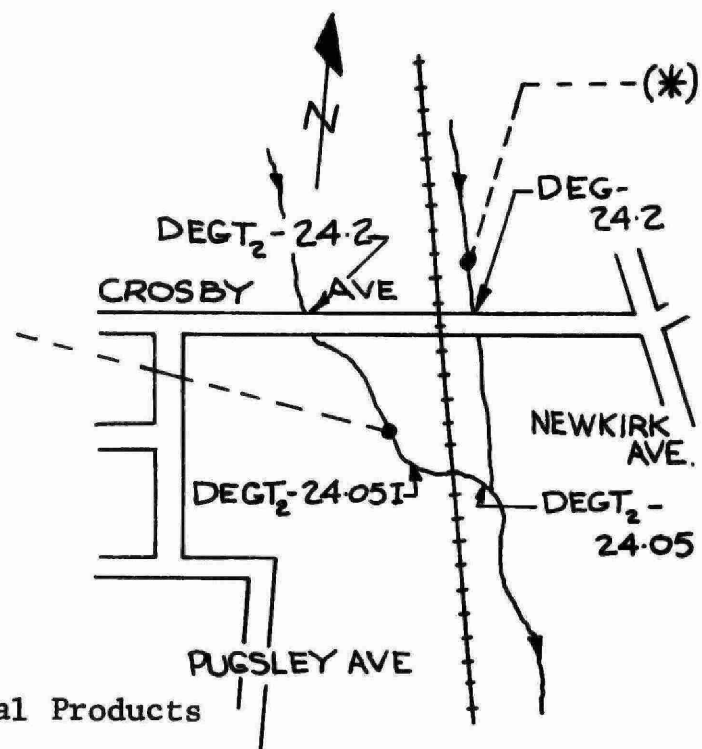
This outfall is 60 inches in diameter and is located behind the town's works yard. According to the plans supplied by the town the only storm sewer outfall located behind the town's works yard is a 21-inch diameter corrugated metal pipe (DEGT₁-23.9W-1). During the survey the above outfall DEGT₁-23.9W was also found at this location. It is imperative that the town maintain accurate and up-to-date storm and sewer plans to aid in location or reduction of pollution. There are other instances whereby outfalls are not shown at points of discharge. The sample results of the 60-inch diameter outfall contain high fecal and total coliform counts. This should be investigated by the town together with other outfalls mentioned.

The water quality at sample point RGBT-23.7 is affected by four storm sewers which discharge at this location and only 2 storm sewers are shown discharging on the town's plans. Over the past year the sample results obtained have fluctuated from high to low, i.e., BOD concentration from 110 ppm to 5 ppm and suspended solids concentration from 800 ppm to 10 ppm. The storm sewer

X. OBSERVATIONS

It is apparent that certain industries in the town have not maintained adequate control with their refuse or materials.

Horticultural Products on Crosby Avenue which produce roses, flowering and tropical plants have allowed plastic bags containing garbage, cardboard cartons and other refuse to impair the creek which flows through their property.



Creek behind Horticultural Products

A creek flowing adjacent to Premier Plastic Ltd. contains refuse, fill material and pieces of plastic. It should be noted that these materials were partially restricting the flow of the watercourse.



LOCATION SHOWN
ON SKETCH ON
PAGE 24 NEAR
DEG-24.2 (*)

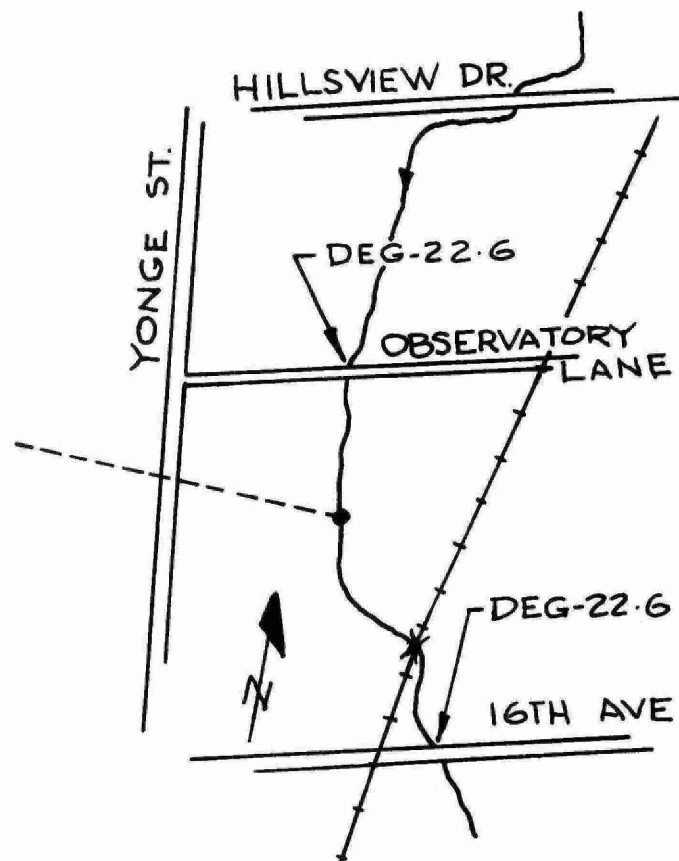
Creek adjacent to Premier Plastic Ltd.

Some white material which appears to be crushed stone is stored behind the Community Building Supplies Limited (Plant No. 2). This material has gained access to the creek located west of their building.

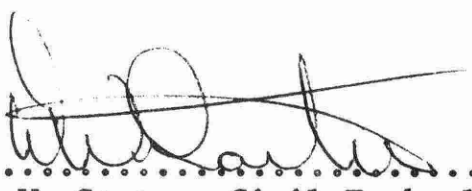
These industries and others whereby a watercourse flows through or adjacent to their property should clear the watercourses of debris or refuse and maintain the aesthetic quality of the watercourse.

Behind the town's works yard on Pugsley Avenue, there was an oil or tar-like substance being trapped by fill material. The town was notified and apparently this was corrected.

It was also observed that parts of German Mills Creek between Hillsvie Drive and 16th Avenue was blocked with floating debris such as branches, logs and other assorted material. These blockages should be cleared to allow free flow in the creek.



Just south of Observatory Lane an outfall and a drainage ditch was located coming from York Block and Building Supply. The effluent from the outfall and drainage ditch was found to contain sewage. The ditch also drained the waste residue from the block processing. To alleviate these problems the septic tank system is going to be corrected and the process residue is going to be pretreated before discharging.

Prepared by: 
D.W. Carter, Civil Technologist
District Engineers Branch
Division of Sanitary Engineering

/cs

GLOSSARY OF TERMS

Bacteriological Examinations - The Membrane Filter Technique is used to obtain a direct count of coliform organisms. These organisms are the normal inhabitants of the intestines of man and other warm-blooded animals. They are always present in large numbers in untreated sewage and are, in general, relatively few in number in other stream pollutants.

Biochemical Oxygen Demand (BOD) - The biochemical oxygen demand test indicates the amount of oxygen required for stabilization of the decomposable organic matter found in sewage, sewage effluent, polluted waters, or industrial wastes, by aerobic biochemical action.

Solids - The analyses for solids include tests for total, suspended and dissolved solids. The total solids is a measure of the solids in solution and in suspension. Suspended solids indicate the measure of undissolved solids of organic or inorganic nature whereas the dissolved solids are a measure of those solids in solution.

Alkyl Benzene Sulfonate (ABS) - The alkyl benzene sulfonate portion of the anionic detergents is reported in ppm. The test is generally employed to indicate the presence of domestic wastewater. The popular use of synthetic detergent for general cleaning purposes have resulted in the incidence of residual ABS in streams. As an

objective, the ABS concentration should not exceed 0.5 ppm in water used for domestic purposes.

Nitrogen

Ammonia Nitrogen or sometimes called free ammonia is the soluble product in the decomposition of nitrogenous organic matter. It is also formed when nitrates and nitrites are reduced to ammonia either biologically or chemically. Some small amounts of ammonia, too, may be swept out of the atmosphere by rain water.

The following values may be of general significance in appraising free ammonia content: low 0.015 to 0.03 ppm; moderate 0.03 to 0.10 ppm; high 0.10 or greater.

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl less the Ammonia Nitrogen measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Nitrite Nitrogen

Nitrite is usually an intermediate oxidation of ammonia. The significance of nitrites, therefore, varies with their amount, sources, and relation to other constituents of the sample, notably the relative magnitude of ammonia and nitrite present. Since nitrite is rapidly and easily converted to nitrate, its presence in concentrations greater than a few thousandths of a part per million is generally indicative of active biological processes in the water.

Nitrate Nitrogen

Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

Phosphorus

Total Phosphorus - Total Phosphorus is a measure of both the organic and inorganic forms of phosphorus present.

Soluble Phosphorus - Soluble Phosphorus is a measure of the orthophosphate only and when subtracted from the total phosphorus gives an indication of the concentration of organic phosphorus present. That is, the soluble phosphorus is a measure of the inorganic phosphorus present, except the phosphorus in the form of polyphosphate, which however, in surface waters is usually insignificant. Inorganic phosphorus in concentration in excess of 0.01 ppm may cause nuisance conditions.

TABLE I

TOWN OF RICHMOND HILLROUGE RIVER

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.	TOTAL	FECAL
RG-23.2	ROUGE RIVER AT BAYVIEW AVENUE AND ELGIN MILLS	29/1/64	2.9	424	-	-	1,100	-
		23/3/64	1.2	324	1	323	3,200	-
		30/6/67	0.7	444	6	438	13,000	-
		10/5/71	0.4	400	5	395	290	130
		19/8/71	1.0	420	15	405	24,000	6,100
RG-23.3	ROUGE RIVER AT BAYVIEW AVENUE AND ELGIN MILLS	29/1/64	2.9	408	-	-	700	-
		23/3/64	2.0	322	1	321	2,600	-
		30/6/67	0.7	450	7	443	5,000	-
		10/5/71	0.4	400	5	395	100	30
		19/8/71	0.8	390	5	385	12,500	1,460

TABLE II
TOWN OF RICHMOND HILL
ROUGE RIVER TRIBUTARY

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			ANIONIC DETERGENTS AS ABS	PHOSPHORUS AS P	COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.			TOTAL	FAECAL
RGT-23.2	TRIBUTARY OF ROUGE RIVER	29/1/64	3.0	622	-	-			18	-
	AT BAYVIEW SOUTH OF	23/3/64	1.1	396	3	393			12	-
	JUDLEA COURT	30/6/67	1.3	490	20	470			14,000	-
		10/5/71	0.4	480	5	475			700	190
		19/8/71	1.2	650	5	645			6,900	10
RGT-23.2W (#)	24" Ø CONCRETE OUTFALL	10/5/71	70	3,380	35	3,345	.5	10	5,400	10
	AT BRIDGE	16/6/71	400	2,340	40	2,300	.7	25	13,000,000	1,330
		19/8/71	700	1,920	60	1,860		27	114,000,000	680
RGT-23.3W	42" Ø CONCRETE OUTFALL	10/5/71	0.4	500	5	495			1,130	300
		19/8/71	6.0	670	5	665			38,000	10
RGT-23.4	TRIBUTARY OF ROUGE	10/5/71	0.4	420	5	415			80	10
	RIVER AT ELGIN MILLS	1/9/71	0.6	560	5	555			2,040	10

(#) - OUTFALL TO BE INVESTIGATED BY TOWN

TABLE III

TOWN OF RICHMOND HILL

ROUGE RIVER - BEAVER CREEK TRIBUTARIES

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			NITROGEN AS N (PPM)				PHOSPHORUS AS P (PPM)		COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.	FREE AMMONIA	TOTAL KJELDAHL	NO ₂	NO ₃	TOT.	SOL.	TOTAL	FECAL
RGBT-23.7 (#)	CREEK BAYVIEW AVENUE	30/6/67	2.0	438	24	414	-	-	-	-	-	-	88,000	-
	AND CROSBY AVENUE	10/5/71	110	2,110	800	1,360	.14	5.0	.11	.62	1.1	.008	50	7
		16/6/71	12	450	15	435	-	-	-	-	-	-	18,000	310
		19/8/71	4	240	10	230	-	-	-	-	-	-	100	20
RGBT-23.7W-1	36" Ø C.I.P. OUTFALL	10/5/71	N O	F L O W										
		19/8/71	N O	F L O W										
RGBT-23.7W-2	36" Ø CONCRETE OUTFALL	10/5/71	N O	F L O W										
		19/8/71	N O	F L O W										
RGBT-23.7W-3	36" Ø CONCRETE OUTFALL	10/5/71	N O	F L O W										
		19/8/71	N O	F L O W										
RGBT-23.7W-4	18" Ø C.I.P. OUTFALL	10/5/71	N O	F L O W										
		19/8/71	N O	F L O W										

(#) - SAMPLE POINTS TO BE INVESTIGATED BY TOWN

TABLE IV

TOWN OF RICHMOND HILLDON EAST - GERMAN MILLS CREEK

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.	TOTAL	FECAL
DEG-22.7	GERMAN MILLS CREEK AT	10/5/71	11	1,000	15	985	<10	<10
	HARDING BOULEVARD	16/6/71	14	1,030	5	1,025	4	4
		10/8/71	6.5	950	10	940	20	10
DEG-22.7W	24" Ø C.I.P. STORM SEWER	10/5/71	N O	F L O W				
	CUTFALL	10/8/71	N O	F L O W				
DEG-23.1	GERMAN MILLS CREEK AT	29/1/64	62	930	83	847	-	-
	ELMWOOD AVENUE	28/6/67	14	872	15	857	100	-
		10/5/71	11	1,000	20	980	<10	<10
		16/6/71	16	1,120	10	1,110	4	4
		10/8/71	7.5	960	10	950	450	8
DEG-23.2T	RICHMOND HILL STP EFFLUENT	17/10/61	36	734	52	682	-	-
		19/6/62	28	742	-	-	-	-
		12/8/63	54	766	45	721	-	-
		29/1/64	52	992	55	937	-	-
		28/6/67	23	896	12	824	76	-
		10/5/71	9	980	15	965	11,300	290
		16/6/71	17	1,100	10	1,090	4	4
		19/8/71	6.5	950	5	945	20	10

TABLE IV (CONT'D)

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			ANIONIC DETERGENTS AS ABS	PHOSPHORUS AS P	COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.			TOTAL	FAECAL
DEG-23.6	GERMAN MILLS CREEK	20/12/63	14	670	21	649			0	-
(#)	AT MARKHAM ROAD	25/12/63	24	722	39	683			21,000	-
		30/12/63	33	760	42	718			0	-
		29/1/64	52	992	55	937			1,230,000	-
		13/3/64	12	1,060	18	1,042			10	-
		28/6/67	2.9	1,220	8	1,212			3,700	-
		10/5/71	15	1,620	25	1,595			4,300	1,030
		16/6/71	4	660	10	650			15,000	1,200
		19/8/71	5.5	880	5	875			40,000	500
DEG-23.6W-1	36" Ø CONCRETE	10/5/71	N O	FLOW						
(#)	OUTFALL, WEST SIDE	16/6/71	280	2,330	40	2,290	30	9.7	44,000,000	1,520
		19/8/71	NOT	SUFFICIENT	FLOW					
DEG-23.6W-2	48" Ø CONCRETE	10/5/71	80	1,600	80	1,520	46	4.3	260,000	2,600
(#)	OUTFALL, EAST SIDE	16/6/71	3.5	24,520	5	24,515	.8	.12	6,900	190
		19/8/71	NOT	SUFFICIENT	FLOW					
DEG-23.8	GERMAIN MILLS CREEK	23/12/63	6.4	1,262	78	1,184			280,000	-
(#)	AT ROSEVIEW AVENUE	30/12/63	4.8	168	23	1,610			150,000	-
		4/2/64	4.8	2,142	16	2,126			-	-
		13/3/64	4.4	1,552	4	1,548			-	-
(#) - OUTFALLS AND SAMPLE POINTS TO BE INVESTIGATED BY TOWN		23/3/64	4.5	964	12	952			42,000	-
		10/5/71	11	980	15	965			2,900	100
		16/6/71	2.4	570	10	560			29,000	300
		19/8/71	55	1,120	35	1,085			4,000,000	24,000

TABLE IV (CONT'D)

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.	TOTAL	FECAL
DEG-24.0	GERMAIN MILLS CREEK	23/3/64	2.2	928	6	922	0	-
	AT RAILWAY TRACKS	10/5/71	20	960	90	870	10	10
	NORTH OF CROSBY	16/6/71	3.5	550	30	320	33,000	240
	AVENUE, EAST OF	19/8/71	2.5	770	10	760	76,000	70
	STATION ROAD							
DEG-24.2	GERMAN MILLS CREEK	23/3/64	1.9	470	5	465	100	-
	AT CROSBY AVENUE AND	30/6/67	1.6	500	4	494	16,000	-
	EAST SIDE OF RAILWAY	11/5/71	32	520	80	440	60	10
	TRACKS	19/8/71	NO FLOW					
DEG-25.0	GERMAN MILLS CREEK	21/5/63	3.2	446	-	-	14,800	-
	AT ELGIN MILLS ROAD	29/1/64	2.5	570	-	-	10,900	-
	& YONGE STREET	23/3/64	1.4	442	5	437	256	-
		11/5/71	0.4	380	5	375	1,200	230
		19/8/71	NOT SUFFICIENT FLOW					

TABLE V
TOWN OF RICHMOND HILL
DON EAST - GERMAN MILLS CREEK TRIBUTARY

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.	TOTAL	FECAL
DEGT ₁ -23.8	TRIBUTARY GERMAN MILLS	19/5/71	9.0	1,340	10	1,330	240,000	1,000
	CREEK AT ROSEVIEW AVENUE	16/6/71	30.	1,200	5	1,195	170,000	2,400
		19/8/71	3.5	900	10	890	360,000	730
DEGT ₁ -23.9W-1 60" C.I.P. OUTFALL BEHIND (#)	WORKS YARD	10/5/71	7.0	1,440	15	1,425	190,000	11,000
		16/6/71	14.0	1,050	5	1,045	298,000	20,000
		19/8/71	4.5	1,040	15	1,025	440,000	11,000
DEGT ₁ -23.9W-2 21" C.I.P. OUTFALL BEHIND	WORKS YARD	16/6/71	1.2	1,030	5	1,025	40	10
		19/8/71	NOT	SUFFICIENT	FLOW			
DEGT ₂ -24.05 (#)	TRIBUTARY TO GERMAN MILLS	23/3/64	2.4	1,144	78	1,066	630	-
	CREEK AT RAILWAY TRACKS	30/6/67	2.3	886	16	870	60	-
		11/5/71	2.0	720	10	710	690	10
		16/6/71	14	1,110	10	1,100	95,000	23,000
		19/8/71	24	960	15	945	2,600,000	20
DEGT ₂ -20.05] OUTFALL FROM MILLS ROSES		11/5/71	0.6	960	5	955	8,500	10
		16/6/71	14	1,110	15	1,095	30,000	20
		19/8/71	3	1,280	10	1,270	14,000	100

(#) - OUTFALL AND SAMPLE POINT TO BE INVESTIGATED BY TOWN

TABLE V (CONT'D)

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.	TOTAL	FECAL
DEGT ₂ -24.2	TRIBUTARY OF GERMAN MILLS	21/5/63	2.3	606	-	-	50	-
	CREEK AT GOSBY AVENUE	29/1/64	14	1,018	-	-	200	-
	JUST WEST OF RAILWAY	23/3/64	1.6	1,042	9	1,033	0	-
	TRACKS	30/6/67	0.9	782	7	775	4	-
		11/5/71	0.4	620	5	615	80	10
		19/8/71	1.6	640	10	630	4,800	10
DEGT ₂ -24.5	TRIBUTARY OF GERMAN	11/5/71	2.5	1,720	10	1,710	230	20
	MILLS CREEK AT YONGE	19/8/71	0.2	520	10	510	10	10
	STREET & TRAYBORN DRIVE							

TABLE VI

TOWN OF RICHMOND HILLDON EAST TRIBUTARY

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.	TOTAL	FECAL
DET-23.7	TRIBUTARY OF EAST DON & VAUGHAN ROAD	28/6/67	3.2	324	10	310	540	-
		11/5/71	1.4	340	5	335	760	10
		20/8/71	2	340	10	330	10,200	1,040
DET-23.9	TRIBUTARY AT FERRYBROOK DRIVE	11/5/71	1.4	300	5	295	660	110
		20/8/71	2.5	290	5	285	3,300	360
DET-24.1	OVERFLOW FROM POND AT MILLS STREET	11/5/71	1.4	320	5	315	240	110
		20/8/71	3.0	280	10	270	1,900	70
DET-24.4W	20" Ø CONCPETE STORM SEWER AT WEST END OF EMERALD STREET	11/5/71	2.0	960	10	950	40	10
		20/8/71	NO	FLOW				
DET-24.5W	24" Ø CONCRETE STORM SEWER AT WEST END OF RUMBLE AVENUE	11/5/71	0.6	1,320	90	1,230	240	30
		20/8/71	NO	FLOW				

TABLE VI (CONT'D)

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)		SOLIDS (PPM)			COLIFORMS/100 ML	
					TOTAL	SUSP.	DISS.	TOTAL	FECAL
DET-24.8W	18" Ø CONCRETE STORM SEWER AT THE WEST END OF LAVEROCK AVENUE	11/5/71	NO	FLOW	NOTED				
DET-25.0	TRIBUTARY AT OXFORD STREET	11/5/71	1.2		400	10	390	560	310
		20/8/71	1.2		470	5	465	1,100	60
DET-25.2	TRIBUTARY AT BATHURST STREET & ELGIN MILLS ROAD	11/5/71	0.4		340	5	335	10	10
		20/8/71	0.4		370	5	365	4,600	300

TABLE VII
TOWN OF RICHMOND HILL
DON EAST & PATTERSON CREEK

SAMPLING POINT NUMBER	LOCATION	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
				TOTAL	SUSP.	DISS.	TOTAL	FECAL
DEP-23.3	PATTERSON CREEK AT	28/6/67	1.4	346	3	343	760	-
	BATHURST STREET &	11/5/71	3.0	420	40	380	1,100	270
	VAUGHAN ROAD	20/8/71	1.2	300	10	290	4,800	250
DEP-24.1	PATTERSON CREEK AT	11/5/71	1.6	420	80	340	1,200	240
	BATHURST STREET	20/8/71	1.0	340	15	324	7,900	1,080

TABLE VIII

TOWN OF RICHMOND HILL

GERMAN MILLS CREEK - NORTH OF S.T.P. OUTFALL - 1971 RESULTS

LOCATIONS	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
			TOTAL	SUSP.	DISS.	TOTAL	FECAL
ROSEVIEW AVENUE DEG 23.8	13/1/71	6.5	1770	5	1765	86,000	-
	17/2/71	8.0	2900	10	2890	27,000	-
	2/3/71	4.0	1090	10	1080	48,000	-
	17/3/71	3.0	760	15	745	2,700	-
	31/3/71	2.5	810	10	800	1,040	-
	21/4/71	5.0	1390	40	1350	20,300	-
	18/5/71	2.0	1760	10	1750	25,000	-
	20/6/71	5.0	1310	190	1120	131,000	-
	30/9/71	4.0	1240	10	1230	31,000	10
MARKHAM ROAD DEG 23.6	1/6/71	2.5	760	10	750	10,000	-
	15/6/71					150,000	-
	16/6/71	18.0	1740	15	1725		
	29/6/71	17.0	850	15	835	460,000	1070
	14/7/71	3.0	1340	220	1120	30,000	100
	4/8/71	5.5	1860	15	1845	12,400	3600
	17/8/71	9.5	1610	210	1400	1.3×10^6	-
	1/9/71	1.6	1490	5	1485	500,000	3670
	1/9/71	1.2	1510	5	1505	301,000	6000
	15/9/71					10,000	50
	16/9/71	4.0	1250	15	1235		

TABLE VIII

TOWN OF RICHMOND HILL

GERMAN MILLS CREEK - S.T.P. OUTFALL - 1971 RESULTS

LOCATIONS	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
			TOTAL	SUSP.	DISS.	TOTAL	FECAL
S.T.P.	13/1/71	9.5	930	15	915	228	-
DEG 23.2T	2/2/71	9.0	860	5	855	-	-
	* 2/2/71	32.0	880	10	870	-	-
	17/2/71	12.0	1070	5	1065	72	-
	2/3/71	28.0	1040	120	920	14,500	-
	+ 17/3/71	22.0	960	20	940	6,000	-
	+ 31/3/71	26.0	1010	25	985	10	-
	21/4/71	17.0	1070	15	1055	110	-
	5/5/71	8.5	920	15	905	22,200	-
	18/5/71	13.0	920	10	910	-	-
	1/6/71	13.0	880	10	870	870,000	-
	15/6/71	18.0	920	10	910	19,400	-
	30/6/71	20.0		15		100	-
	13/7/71	13.0				-	-
	4/8/71	13.0		10		6150,000	-
	17/8/71	14.0		15		L 10	-
	1/9/71	7.0		10		L 10	-
	16/9/71	13.0		10		10	-
	30/9/71	13.0		5		L 10	-

+ INCLUDING BY-PASS

* COMPOSITE 12:00 AM - 4:00 PM

TABLE VIII

TOWN OF RICHMOND HILL

GERMAN MILLS CREEK - SOUTH OF S.T.P. OUTFALL - 1971 RESULTS

LOCATIONS	DATE	5-DAY BCD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
			TOTAL	SUSP.	DISS.	TOTAL	FECAL
ELMWOOD AVENUE DEG 23.1	13/1/71	6.5	960	5	955	160	56
	2/2/71	14	860	5	855	160	-
	17/2/71	11	1,130	15	1,115	304	-
	2/3/71	34	1,090	130	960	1,700	-
	17/2/71	16	910	60	850	10,000	-
	31/3/71	22	950	30	920	30	-
	21/4/71	9.0	1,150	10	1,140	1,100	-
	18/5/71	8.5	960	10	950	800	-
	1/6/71	3.5	940	5	935	59,000	-
	5/6/71	-	-	-	-	22,000	-
	16/6/71	24	960	10	950	-	-
	29/6/71	17	850	15	835	10	10
	30/6/71	14	860	20	840	6,500	100
	20/7/71	20	820	15	805	32,000	100
	4/8/71	20	930	15	915	1,500	10
	17/8/71	11	920	10	910	10	-
	1/9/71	5	940	5	985	8,800	30
	1/9/71	8	960	10	950	4	4
	15/9/71	-	-	-	-	2,600,000	250
	16/9/71	9	910	10	900	-	-
	30/9/71	4	850	10	840	1,000	10

TABLE VIII (CONT'D)

LOCATIONS	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
			TOTAL	SUSP.	DISS.	TOTAL	FECAL
OBSERVATORY LANE DEG 22.6 (#)	13/1/71	12	930	10	920	<4	<4
	2/2/71	20	900	120	780	4	-
	17/2/71	18	920	15	905	4	-
	2/3/71	24	1,000	120	880	800	-
	17/3/71	12	830	60	770	30	-
	31/3/71	12	870	25	845	4	-
	21/4/71	12	1,210	15	1,195	70	-
	18/5/71	40	980	20	960	2,900,000	-
	1/6/71	10	960	10	950	150,000	-
	15/6/71	-	-	-	-	40,000	-
	16/6/71	42	880	15	865	-	-
	29/6/71	22	780	15	765	23,000,000	5,300
	30/6/71	15	820	25	795	7,800	100
	4/7/71	16	800	15	785	150,000	100
	4/8/71	30	840	15	825	1,500	10
	7/8/71	8	900	20	880	10	-
	1/9/71	4.2	950	10	940	10	10
	1/9/71	8	890	10	880	1,460	10
	15/9/71	-	-	-	-	700,000	10
	16/9/71	11	850	15	835	-	-
	30/9/71	11	830	10	820	1,000	10

(#) - SAMPLE POINT TO BE INVESTIGATED BY TOWN

TABLE VIII (CONT'D)

LOCATIONS	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
			TOTAL	SUSP.	DISS.	TOTAL	FECAL
16TH AVENUE DEG 22.2	13/1/71	10	900	5	895	<4	<4
	2/2/71	17	860	100	760	20	-
(#)	17/2/71	20	1,240	5	1,235	4	-
	2/3/71	18	990	60	930	12	-
	17/3/71	7	910	60	850	4	-
	31/3/71	8	790	20	770	4	-
	21/4/71	12	980	45	935	80	-
	18/5/71	22	820	10	910	300,000	-
	1/6/71	13	905	25	880	350,000	-
	15/6/71	-	-	-	-	55,000	-
	16/6/71	34	930	15	915	-	-
	29/6/71	20	800	10	790	23,000,000	230,000
	30/6/71	10	830	15	815	17,000	1,000
	14/7/71	20	820	15	805	109,000	100
	4/8/61	19	840	15	825	15,000	10
	17/8/71	14	900	30	870	2,200	-
	1/9/71	8.5	890	10	880	30	10
	1/9/71	19	930	45	885	151,000	1,100
	15/9/71	-	-	-	-	490,000	10
	16/9/71	11	920	25	895	-	-
	30/9/71	11	850	10	840	1,000	10

(#) - SAMPLE POINT TO BE INVESTIGATED BY TOWN

TABLE VIII (CONT'D)

LOCATIONS	DATE	5-DAY BOD (PPM)	SOLIDS (PPM)			COLIFORMS/100 ML	
			TOTAL	SUSP.	DISS.	TOTAL	FECAL
BAYVIEW AVENUE DEG 21.0 (#)	13/1/71	6.5	880	10	870	<4	<4
	17/1/71	19	1,000	10	990	1,400	-
	2/3/71	6	790	10	780	40	-
	17/3/71	6	600	35	565	700	-
	31/3/71	6	505	15	490	56	-
	11/4/71	7.5	920	40	880	12,800	-
	18/5/71	26	940	15	925	16,200,000	-
	1/6/71	24	810	30	780	700,000	-
	15/6/71	-	-	-	-	24,600	-
	16/6/71	20	870	10	860	-	-
	29/6/71	20	850	10	840	270,000	900
	30/6/71	13	850	15	835	33,000	1,000
	14/7/71	24	770	20	750	93,000	80
	4/8/71	14	860	10	850	47,000	490
	17/8/71	13	860	25	835	410	-
	1/9/71	28	940	55	885	3,500,000	1,500
	1/9/71	26	950	50	900	206,000	1,300
	15/9/71	-	-	-	-	390,000	30
	16/9/71	20	810	20	790	-	-
	30/9/71	7	850	10	840	3,000	40

(#) - SAMPLE POINT TO BE INVESTIGATED BY TOWN



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